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Effects of attitudes towards ambiguity on subclinical depression and anxiety in healthy individuals

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Abstract

This study aims to examine the effects of multidimensional attitudes towards ambiguity on subclinical depression and anxiety in healthy individuals. Attitudes Towards Ambiguity Scale, consisting of four clusters (enjoyment, anxiety, exclusion, and noninterference), Self-Rating Depression Scale, and State-Trait Anxiety Inventory–trait version were administered to 1019 Japanese volunteers. The result of a regression analysis suggested that the score of Attitudes Towards Ambiguity Scale–enjoyment factor significantly contributed to the Self-Rating Depression Scale score while that of Attitudes Towards Ambiguity Scale–anxiety factor significantly contributed to the State-Trait Anxiety Inventory–trait score. Among attitudes toward ambiguity, enjoyment may have protective effects against subclinical depression whereas anxiety can enhance anxiety-trait in nonclinical individuals.

Keywords

ambiguity tolerance, attitude, hierarchical multiple regression analysis, Self-Rating Depression Scale, State-Trait Anxiety Inventory, uncertainty

It is known that not only stressful situations but also ambiguous ones can cause impairments to mental health (Friedland et al., 1999; Friedland and Keinan, 1991; Keinan, 1994). Depression and anxiety are highly prevalent psychiatric symptoms associated with psychological stress (Friedland et al., 1999; Friedland and Keinan, 1991; Keinan, 1994). Although it is unclear whether ambiguous situations are generally stressful for individuals or not, the possibility of ambiguity being a risk factor for depression and anxiety needs to be investigated.

Ambiguity has been explained as various terms, for example, vagueness, incompleteness, fragmentation, unstructured situations, lack of information, uncertainty, inconsistency, and unclearness, sometimes including contradictive or even contrary implication (Norton, 1975). This concept has been investigated in different psychological studies, but mainly in relation to the tolerance of ambiguity (TA). Frenkel-Brunswik (1949) identified intolerance of ambiguity as a personality trait with a tendency to perceive problems in black or white terms in order to obtain easy and fast solutions for complicated situations. However, this type of problem solution might often result in denial of harsh reality, oversimplification of complexity, and sometimes even overlooking the hidden value of reality. Budner (1962) defined TA as the capacity to perceive ambiguous situations as somewhat desirable rather than as a disposition to interpret ambiguity as a source of a threat.

Findings on the relationship between ambiguity and mental health have indicated that TA is negatively correlated with anxiety (Bardi et al., 2009; Hamilton, 1957; MacLeod and Cohen, 1993; Smock, 1955). Likewise, intolerance of ambiguity has been associated with the vulnerability to depression (Andersen and Schwartz, 1992). Moreover, a

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recent study using behavioral and functional neuroimaging (Gilboa-Schechtman et al., 2005) has suggested that individuals with anxiety disorders show more emotional processing of ambiguous information as compared with healthy people. Meanwhile, several studies have failed to show a significant relationship between TA and traits of depression and anxiety (Bisson and Sears, 2007; DeRoma et al., 2003; Litman, 2010). Therefore, the influence of TA on mental health still remains a controversial issue that needs to be reexamined from a broader perspective.

The first reason for the discrepant results between TA and anxiety/depression is insufficient consideration of qualitative aspects of TA in previous studies. A majority of previous studies have initially considered TA as a quantitative index and have hypothesized that TA is indicative of resilience to ambiguous situations. However, Huppert et al. (2003) suggested that a simple dichotomy like positive and negative biases is not applied to interpretation of ambiguity. As a result, the quality of TA needs to be reassessed from a multidimensional instead of a unidirectional perspective.

Second, most previous studies have simply focused on the degree of TA as the strength of resilience. However, it is necessary to comprehensively evaluate TA as a sequential cognitive/emotional/behavioral reaction and conceptualize TA as diverse attitudes towards ambiguity and not merely as the strength of resilience to ambiguity. Frenkel-Brunswik (1949), who developed the TA theory, originally defined TA as an "attitudinal" variable. Moreover, other authors have supported that the concept of TA consists of cognitive, affective and behavioral reactions contributing to a comprehensive attitude to ambiguous stimuli or situations (Bhushan and Amal, 1986). Therefore, integration of the concept of tolerance and attitudinal perspectives towards ambiguity is a prerequisite for an accurate assessment of the relationship between ambiguity and anxiety and depression.

Durrheim and Foster (1997) developed the Attitudinal Ambiguity Tolerance scale (ATT), consisting of four dimensions of attitudes towards ambiguity albeit with a focus on social and religious biases. Recently, Lauriola et al. (2016) designed a new scale for assessing multidimensional attitudes towards ambiguity based on an affective-cognitive-epistemic model. However, this scale failed to include positive and behavioral aspects of attitudes towards ambiguity. The study has limited validity because the factor model was confirmed in a biased sample (Lauriola et al., 2016).

Furnham (1994) proposed the possible necessity of a multidimensional model of attitudes towards ambiguity in addition to the concept of ambiguity tolerance. Based on this suggestion, Nishimura (2007) developed the Attitudes Towards Ambiguity Scale (ATAS). Recently, Enoki et al. (2018) proved a four-factor model of ATAS that included enjoyment, anxiety, exclusion, and noninterference towards ambiguity, which was based on a 2×2-dimensional structure consisting of the psychological basis of attitudes (cognitive/emotional vs behavioral) and dynamics of attitudes (active/dynamic vs passive/static). Accordingly, the ATAS can be more useful for clarifying the diversity of cognitive/emotional/behavioral response to ambiguity and its association with symptoms of depression and anxiety than assessments based on the concept of TA. Therefore, for the present study we adopted the ATAS (Nishimura, 2007) with the four-factor model (Enoki et al., 2018) to redefine and clarify the concept of TA from multidimensional and attitudinal perspective in relation to subclinical depression and anxiety in healthy Japanese volunteers.

Methods

Participants

Questionnaires were administered along with a leaflet explaining the purpose of this study and were distributed to Japanese volunteers by our research collaborators. Initially, 1340 participants responded to the questionnaires between November and December 2013. Among the 1340 respondents, 321 who reported past or present psychiatric illness were excluded from the analysis as the study design sought to investigate the relationship between attitudes toward ambiguity and subclinical anxiety and depression in non-clinical population for the purpose of promoting mental health. The differences in the impact of these effects between clinical and non-clinical participants are planned to be reported in the future.

We analyzed the data of 1019 participants (506 males and 513 females; mean age 34.09 years, standard deviation (SD) = 12.68, age range 18–78 years: 102 teens, 336 in 20s, 235 in 30s, 218 in 40s, 93 in 50s, and 35 in 60sor older). The participants consisted of 687 employed and 332 unemployed people, including students and homemakers. The respondents were divided into those living in Okinawa island (n = 806) and the main islands of Japan (n = 213). This study used the same dataset as our previous study (Enoki et al., 2018).

Assessments

Each participant responded to the psychometric batteries and provided demographic data that included their age, sex, and employment status (employed or unemployed), as well as past and present psychiatric illnesses. Thereafter, the following psychometric scales were administered to them.

ATAS. The ATAS is a 25-item, self-rating scale in Japanese (Enoki et al., 2018) that was initially developed by Nishimura (2007). This scale is suitable for assessing attitude patterns about ambiguous situations. The validity and reliability of the scale have been established (Enoki et al., 2018; Nishimura, 2007). Each item is scored on a 6-point

Likert-type scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*).

Enoki et al. (2018) conducted both exploratory and confirmatory factor analyses of responses by healthy Japanese volunteers and extracted the four-factor model of the ATAS consisting of enjoyment, anxiety, exclusion, and noninterference. The enjoyment factor (12 items) shows the enjoyment element as a positive emotion, that is, perceiving ambiguity as attractive and pleasurable when involved in ambiguous situations. The anxiety factor (six items) is defined as emotional confusion in being anxious in unfamiliar and complicated situations as well as a difficulty in coping with such situations (Nishimura, 2007). The exclusion factor (four items) consists of rejection of inconsistency (Nishimura, 2007) and decision-making based on dichotomous thinking, mainly from a behavioral perspective (Enoki et al., 2018). The noninterference factor (three items) estimates neutral and passive attitudes, including taking no action and leaving ambiguous situations as they are (Enoki et al., 2018).

The Zung Self-Rating Depression Scale. The Japanese version (Fukuda and Kobayashi, 1973) of the Zung Self-Rating Depression Scale (SDS: Zung, 1965), which consists of 20 items, was administered to the participants to measure depressive states. Each item is scored on a 4-point Likert-type scale ranging from 1 (*a little of the time*) to 4 (*most of the time*). The reliability and validity of the Japanese version of the scale have been established (Fukuda and Kobayashi, 1973).

The State-Trait Anxiety Inventory–trait version. The original English version of The State-Trait Anxiety Inventory (STAI)-Form Y (Spielberger et al., 1983) has been translated to the Japanese version of the STAI-Form JYZ (Hidano et al., 2000). The responses to STAI-JYZ are provided on a 4-point Likert-type scale ranging from 1 (*almost never)* to 4 (*almost always*). The STAI-JYZ has been validated using Japanese samples (Hidano et al., 2000), and consists of two subscales: state anxiety and trait anxiety. The state anxiety subscale reflects temporary responses to situations inducing anxiety and the trait anxiety subscale reflects individual differences in the personality traits of anxious perceptions. Each subscale consists of 20 items. Only the trait version of STAI-JYZ (STAI-trait) was used to measure individual anxiety traits in this study.

Ethics

This study was planned in accordance with the Ethical Code for the Epidemiologic Studies of the University of the Ryukyus and was approved by the Ethical Review Board for Epidemiologic Studies of the University of the Ryukyus (#175). Documents for explanation that were given to the participants included the purpose of the study, voluntary participation in the study, protection of personal information, the right to withdraw from the study, possible personal benefits, and expected social contributions of the study. All the participants took part in the study voluntarily and anonymously provided background data and responses to the questionnaires. Only coded and grouped data were used for analyses.

Statistical analyses

Pearson's correlation was used to analyze relationships among the ATAS subscales, the SDS, and the STAI-trait (Table 1). Hierarchical multiple regression analysis was performed to detect the effects of age, sex, employment, and the ATAS subscales on SDS and STAI-trait scores (Table 2). Due to the close relationship and strong interactions between anxiety and depression (Clark and Watson, 1991; Kessler et al., 1999; Kircanski et al., 2017; Lovibond and Lovibond, 1995; Masi et al., 2000), in the hierarchical multiple regression analysis, the STAI-trait was entered as an independent variable when predicting the SDS, and the SDS was entered when predicting STAI-trait (Table 2). Dummy variables were used for sex (0 for coding males and 1 for coding females; Tables 1 and 2), employment (0 for coding unemployed and 1 for coding employed; Tables 1 and 2), and locality (0 for coding the Okinawa island and 1 for coding the main islands of Japan; Table 1). A two-tailed p-value of less than .05 was regarded as statistically significant. SPSS 19.0.1 for Windows (IBM Japan Inc., Tokyo, Japan) was used for statistical analyses.

Results

Single correlations among age, sex, employment, locality, ATAS subscales, SDS, and STAI-trait

As shown in Table 1, the results indicated that age was negatively and weakly correlated with the SDS ($r=-.22$, $p<.001$) and the STAI-trait scores ($r=-.31$, $p<.001$). Moreover, a very weak correlation was found between sex and the SDS score ($r=.15$, $p<.001$) and the STAI-trait score ($r=.08$, $p<.05$). Employment was negatively correlated with SDS ($r=-.20$, $p<.001$) and the STAI-trait ($r=-.22$, $p<.001$). Furthermore, the anxiety subscale of the ATAS was moderately correlated with the SDS score ($r=.36$, $p<.001$) and the STAI-trait score ($r=.49$, $p<.001$), whereas the enjoyment subscale score was very weakly correlated with SDS score ($r=-.19$, $p<.001$) and the STAI-trait score ($r=-.14$, $p<.001$).

Hierarchical multiple regression analysis of factors contributing to SDS and STAI-trait

Table 2 shows the results of hierarchical multiple regression analysis steps conducted to confirm different contributing

Table 1. Correlations among scores of ATAS subscales, SDS, and STAI-trait.

	Sex	Employment	Locality	ATAS subscales				SDS	STAI-trait
				Enjoyment	Anxiety	Exclusion	Non-interference		
Age	−.20***	.59***	.13***	−.02	−.26***	−.06	.02	−.22***	−.31***
Sex		−.32***	−.12***	−.06	.20***	.01	.01	.15***	.08*
Employment			−.11***	.01	−.24***	−.03	−.04	−.20***	−.22***
Locality				−.08*	−.05	−.01	−.01	−.02	−.01
ATAS subscales									
Enjoyment					.07*	.26***	.22***	−.19***	−.14***
Anxiety						.37***	.10**	.36***	.49***
Exclusion							−.19***	.08*	.15***
Noninterference								−.02	.00
SDS									.82***

SDS: Zung Self-rating Depression Scale; STAI-trait: State-Trait Anxiety Inventory–trait version; ATAS: Attitudes Towards Ambiguity Scale.
Dummy variables were used for sex (0: males, 1: females), employment (0: unemployed, 1: employed), and locality (0: the Okinawa island, 1: the main islands of Japan).
Significant correlations (*$p < .05$; **$p < .01$; ***$p < .001$).

Table 2. Hierarchical multiple regression analysis (SDS and STAI-trait).

	SDS				STAI-trait		
	β	R^2	ΔR^2		β	R^2	ΔR^2
Step 1		.07***				.10***	
Age	−.16***				−.27***		
Sex	.10**				.01		
Employment	−.08				−.05		
Step 2		.68***	.61***			.69***	.60***
Age	.07**				−.15***		
Sex	.09***				−.07***		
Employment	−.03				.01		
STAI-trait	.82***			SDS	.80***		
Step 3		.69***	.01***			.73***	.04***
Age	.06**				−.12***		
Sex	.09***				−.09***		
Employment	−.04				.02		
STAI-trait	.84***			SDS	.73***		
ATAS subscales							
Enjoyment	−.06**				−.03		
Anxiety	−.04				.21***		
Exclusion	−.02				.02		
Noninterference	−.01				.01		

SDS: Zung Self-rating Depression Scale; STAI-trait: State-Trait Anxiety Inventory–trait version; ATAS: Attitudes Towards Ambiguity Scale.
Dummy variables were used for sex (0: males, 1: females) and employment (0: unemployed, 1: employed).
Significant correlations (**$p < .01$, ***$p < .001$).

factors, including significant demographic items and ATAS subscales, using SDS and the STAI-trait as dependent variables. Age, sex, and employment were independent variables in the first step, followed by the STAI-trait or the SDS as an additional independent variable in the second step. Finally, four subscales of the ATAS were added as independent variables in the third step.

Regarding the SDS score, the contribution of age and sex was significant but very small in the first step ($R^2 = .07$, $p < .001$). A significant increase in the coefficient of determination was observed after adding the STAI-trait score as the other emotional component in the second step ($\Delta R^2 = .61$, $p < .001$) and after adding the ATAS subscale scores in the third step ($\Delta R^2 = .01$, $p < .001$). Even after controlling for

age, sex, employment, and anxiety, the enjoyment subscale of the ATAS made a significant contribution to the SDS score ($\beta = -.06$, $p < .01$).

Regarding the STAI-trait score, the contribution of age was also significant but very small in the first step ($R^2 = .10$, $p < .001$). A significant increase in the coefficient of determination was observed after adding the SDS score as the other emotional component in the second step ($\Delta R^2 = .60$, $p < .001$) and after adding the ATAS subscale scores in the third step ($\Delta R^2 = .04$, $p < .001$). The contribution of anxiety subscale of the ATAS to the STAI-trait score was significant even after controlling for age, sex, employment, and depression ($\beta = .21$, $p < .001$).

Discussion

The results demonstrated that multidimensional attitudes toward ambiguity had a modest significance in affecting subclinical depression and anxiety in non-clinical individuals. A hierarchical multiple regression analysis (Table 2) indicated that the enjoyment factor assessed by the ATAS subscales attenuated depression, but that was not the case with anxiety. On the other hand, the anxiety factor of the ATAS enhanced anxiety but not depression. Moreover, more anxious manifestations in younger individuals and more depressive profiles in female gender were indicated in this study (Tables 1 and 2), which supported the findings of previous studies (Crawford et al., 2011; Knight et al., 1983; Marcus et al., 2005).

The enjoyment toward ambiguity appears to be a factor that provides modest protection from subclinical depression (Table 2), which is partly consistent with a prior study suggesting that "curiosity" as a proximal concept or a constitutional component of the enjoyment toward ambiguity buffers distress from suicidal ideation (Denneson et al., 2017) and predicts a future decrease in depressive symptoms (Kawamoto et al., 2017). In fact, enjoyment toward ambiguity might at least partly encompass the concept of "mindfulness" and "acceptance," as shown on the enjoyment subscale of ATAS containing statements such as "I like it when something is open to multiple interpretations as it gives me the freedom to see things from different perspectives" and "I can accept incompleteness to some extent" (Enoki et al., 2018). Therefore, the readiness to elucidate ambiguity from open attitudes, together with an enjoyable acceptance of incompleteness might offer protection from subclinical depression.

In addition, a previous study conducted by the authors of this study demonstrated a close relationship between ATAS subscale scores and the Acceptance and Action Questionnaire score (Enoki et al., 2018). This finding suggests that an attitude of enjoyment toward ambiguity might help avoid inflexible attitudes, and thereby reduce the potential risk of subclinical depression even when faced with ambiguous situations. Moreover, enjoyment of ambiguity might also provide a moratorium between reactive cognition of unclarified situations and instantly evolved emotions. This might be particularly helpful in preventing a shortcut to depression through automatic negative thoughts (Cho and Telch, 2005).

The anxiety about ambiguity could be a factor enhancing anxious traits in non-clinical individuals (Table 2). This possibility is supported by a previous study suggesting that interpretation under insufficient information (Naveh-Benjamin et al., 1981) tends to be selectively affected by fear (Mathews, 1990), which provokes more anxiety under "vague" situations as well. It has been indicated that another concept, "the uncertainty about the future" (Grenier et al., 2005) is closely related to anxiety symptoms in generalized anxiety disorder (Carleton, 2016). There are certain differences between ambiguity in dealing with the current situation and uncertainty about the future. Nevertheless, having no clues might generally provoke anxiety about the present and the future.

It has been suggested that individuals who are intolerant to ambiguity tend to perceive the real world as fixed and concrete (Andersen and Schwartz, 1992). This implies that ambiguity-intolerant individuals are likely to approach ambiguous topics and situations in an inflexible manner. Our recent study suggested that there is a negative association between anxiety assessed by the ATAS and psychological flexibility in relation to unwanted private experiences (Enoki et al., 2018). As a result, inner experiences habitually evolve from inflexible perceptions and attitudes in ambiguous situations, which gradually result in acquiring anxiety traits in non-clinical individuals.

The above discussion suggests that enhancing enjoyable attitudes, together with developing curiosity and creativity about ambiguous and uncertain situations, could be a useful strategy for promoting the mental health of the general population. Moreover, leaving ambiguity as it is might also be an important strategy, especially for people struggling against automatic anxiety resulting from inflexible cognitions. These attitudinal changes in non-clinical individuals could lead to increased willingness and acceptance (Hayes, 2004) to maintain and improve mental health. Enjoyment and anxiety about ambiguity do not reflect a single dimension similar to TA, but include multidimensional aspects of diverse cognitions, emotions, and attitudes in individuals. Therefore, the results of this study suggest that interindividual variability in attitudes toward ambiguity, rather than the TA, would diversely affect the mental health of individuals who are living in the modern world, which is full of ambiguity and uncertainty.

Conclusion

The effects of multidimensional attitudes toward ambiguity on subclinical depression and anxiety symptoms were investigated in 1019 non-clinical individuals. The present results suggest that, among different attitudes towards

ambiguity, enjoyment might have a protective effect against subclinical depression, while anxiety might enhance the anxiety trait of non-clinical individuals.

Limitation

The limitations of this study include only the modest contribution of the ATAS elements to depression and anxiety symptoms indicated by hierarchical multiple regression analysis as well as unclear implications for clinically depressed or anxious patients. Regarding mental health promotion, the effectiveness of enhancing an enjoyable attitude toward ambiguity and an attitude of leaving ambiguity as it is should be explored in future studies.

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Compliance with ethical standards

Informed consent was obtained from all participants who took part in the study. All procedures conducted in studies involving human participants accorded with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration with its later amendments or comparable ethical standards. This study was planned in accordance with the Ethical Code for the Epidemiologic Studies of the University of the Ryukyus and was approved by the Ethical Review Board for Epidemiologic Studies of the University of the Ryukyus (#175).

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